DOCUMENT RESUME

ED 231 103 EC 151 978

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TITLE Procedures for Selecting a Nonspeech Communication Mode and Facilitating Its Use through Incidental Training.
INSTITUTION Kansas Univ., Lawrence. Early Childhood Inst.
PUB DATE 82
NOTE 46p.; An expanded version of a Paper presented at the International Symposium on Autism: A Transdisciplinary View of Current Research and Methods (Woodbury, NY, February 25, 1982). Print is light.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Autism; Individual Needs; *Intervention; *Language Handicaps; Parent Role; Student Evaluation; *Training Methods

ABSTRACT

Factors in selecting a nonvocal mode for language training with individual children are described, along with the results of this selection procedure as applied to five autistic children (5 to 8 yeas old). Attention is also directed to the rationale for, and the specific steps involved in, four techniques that parents can be trained to use to facilitate their child's learning and functional use of the nonspeech training mode. It is noted that in deciding which mode to use in training, the clinician should consider a child's functional communication channel and the characteristics of nonspeech modes. In addition to choosing a nonspeech mode, the use of the nonvocal mode with five autistic children required the training of language responses with one mode and assessing the children's learning of the mode, and training and assessing different language responses with the other mode. Training experiences with each of the four children are described, along with issues concerning long term training of the prescribed nonspeech mode. Illustrations are presented of how four techniques may be incidentally used to train speech (i.e., the Model Procedure, the Mand-Model Procedure, the Delay Procedure, and the Incidental Teaching Procedure). Appended materials include a list of 19 references, a description of experimental conditions, and a flowchart of a sample traning procedure. (SEW)

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PROCEDURES FOR SELECTING A NONSPEECH COMMUNICATION MODE AND FACILITATING ITS USE THROUGH INCIDENTAL TRAINING

Cathy L. Alpert

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Procedures for Selecting a Nonspeech Communication Mode and Facilitating Its Use Through Incidental Training

Cathy L. Alpert

This paper is an expanded version of the paper presented at The International Symposium on Autism: A Transdisciplinary View of Current Research and Methods, Woodbury, New York, February 25, 1982.

Introduction

The application of nonspeech communication modes with autistic children has become increasingly popular over the last several years. There are at least two main reasons which are responsible for the initial interest over the potential effectiveness of nonspeech communication. The first reason has to do with research and clinical findings indicating that speech therapy is often very time-consuming for the clinician and relatively unproductive for the child. Therapy is unproductive in the sense that either: (1) the child does not use speech, even in the training environment; or (2) speech may be used in the training environment, but not functionally, for purposes of communication; or (3) the child talks in the training environment, but his speech does not generalize to other, non-training environments.

Also contributing to the use of nonspeech modes with autistic children was increasing knowledge about the relationship between the ability to communicate and the ability to establish social relationships. Since improvement in social development has been associated with the presence of useful speech, some say by age 5 (Eisenberg, 1956; Rutter, 1970), emphasis has been placed on introducing effective language-training procedures as early as possible.

It was the growing awareness of the limitations of traditional speech training, plus a realization of the importance of instituting effective communication training as early as possible, that led more and more interventionists to try alternative nonvocal language training. Various nonspeech modes (including sign, pictures, abstract plastic symbols, and the written word) have been used with autistic persons in the hope that they would facilitate or augment the acquisition of a more natural spoken language.

Furthermore, if speech was not acquired, the trained nonvocal mode would provide an alternative, functional means of communicating with others.

The feasibility of training a nonspeech communication mode has greatly expanded the range of language intervention approaches available to the clinician. It also raises some new questions: For example, at what point should the nonspeech procedures be introduced? - as an initial means of intervention, or only after speech training has proved to be generally ineffective? A second question asks - once the decision is made to train a nonvocal communication mode, on what basis does one decide which nonspeech mode to train? And finally, after a nonspeech mode has been selected, how should training be implemented in order to optimize learning and facilitate generalization across people and settings?

It is the purpose of this paper to address the two latter issues. More specifically, I will first describe a particular procedure that permits an empirically based decision concerning the optimal nonspeech mode to prescribe for training with individual children. I will also discuss the results of this selection procedure as applied to five autistic children.

The second purpose of this paper is to describe the rationale for, and the specific steps involved in, four techniques that parents can be trained to use to facilitate their child's learning and generalized functional use of the prescribed nonspeech training mode.

Factors in Selecting a Nonvocal Mode for Language Training

As mentioned above, the language clinician's decision to teach a nonspeech communication mode raises the immediate question of which mode to train. A number of nonspeech systems exist, including at least four systems of signing: (1) The Rochester Method of simultaneous speech plus fingerspelling;

(2) Signing Exact English (Gustason, Pfetzing, & Zawolkow, 1972); (3) Seeing Essential English (Anthony, 1971); and (4) American Sign Language. There are iconic or ideographic symbol systems such as pictorial communication boards, rebus (Woodcock, Clark, & Davies, 1968), and Blissymbols (Bliss, 1965). There are abstract symbol systems such as the Non-Speech Language Initiation Program which is better known as Non-SLIP (Carrier & Peak, 1975). There are other nonspeech modes such as the orthographic symbol system which may be taught through the phonetic or whole word approach to reading. There are electronic talking machines; and there are tactile systems similar to braille. In selecting a nonspeech mode for training, the clinician should be able to identify those criteria upon which his or her decision to teach one of these modes over the others are based.

Hollis, Carrier, and Spradlin (1976) stated that a functional communication channel must be established before intervention techniques can be applied. Establishing a functional communication channel involves identification of a sensory input mode through which to present stimuli, an integrative process or conceptual level, and a response output mode. The sensory input mode could be visual, auditory, tactile, or olfactory. The integrative process or conceptual mode could be, in order of increasing difficulty, imitative, nonimitative, constructive, or transformative. And the response output mode could be gross motor movements, signing, writing, or speech. While the necessity of determining a functional communication channel is evident, the process is more difficult for some children than for others. For example, when prescribing for a blind or motorically impaired child, restrictions are automatically placed on functional input and output modes. Prescribing a functional communication channel for autistic children, on the other hand,

is much more challenging because of the difficulty of determining the existence and comparative severity of sensory impairments.

With regard to the sensory impairments of autistic children, Ornitz and Ritvo (1968) noted that unusual perceptual aberrations may be seen in the auditory, visual, tactile, gustatory, and olfactory senses. They further noted in 1976 that the failure of adequate modulation of sensory input appears behaviorally as hypo- or hyperresponsive states that alternate in the same child. Thus, for example, a child may either be very sensitive to, or may not respond to, auditory stimuli. A hyperresponsiveness to sound can be exemplified by children who cover their ears and show signs of distress upon hearing sounds such as a dog's barking, or a siren, or the noise of a vacuum cleaner. In contrast the same children could show hyporesponsiveness when a sudden noise or someone calling out their name, fails to evoke a visible reaction. Hypo- or hyperresponsiveness in the visual modality can be illustrated respectively when the child walks into or past objects as if he or she didn't see them, and when the child becomes upset over minor relocation of objects in the home. Visual hyperresponsiveness also occurs when the child scrutinizes marks, tears, or discolorations in furniture and clothing. Unusual responsiveness to tactile, gustatory, and olfactory senses have also been described.

In sum, the range of sensory deficits in an individual autistic child may be broad and varied. Assessing the type and degree of these impairments in order to establish a functional communication channel, may be a very difficult task for the clinician. However, in order to determine which mode a child is most likely to learn, the clinician's best efforts must be placed toward identifying functional stimulus input and response output channels.

The clinician must also consider the characteristics of individual nonspeech modes. Nonspeech systems can be described in terms of: the input and output modes used, iconicity versus arbitrariness, permanence versus transitivity, complexity versus simplicity, time required for transmission, and degree to which presentation can be automated. Nonspeech systems can also be described according to whether they are orthographic, word-unit, or concept-based in nature. In some cases, a decision concerning which mode to train can be determined by weighing information about a child's functional communication channel with information about the characteristics of nonspeech modes. Oftentimes, however, insufficient or ambiguous information about sensory impairments prevents identification of the optimal "functional communication channel". Furthermore, with regard to nonspeech modes, it may be difficult to determine which mode is the most suitable without giving individual children direct experience with several modes.

Overview of a Procedure for Identifying the Optimal Nonspeech Mode

Purpose, setting, and subjects. In the following paragraphs, a study will be described which was conducted for the purpose of developing a procedure that would enable language interventionists to identify factors that indicate which nonspeech mode to prescribe for training with individual children. The study was conducted at the Judevine Center for Autistic Children in St. Louis, Missouri. The subjects were five autistic children who ranged from five to eight years of age. They had individually received between two to five years of intensive speech therapy in various settings. At the time the study was instigated, none of the children had effective means of functional communication.

Design. The study, which used a multiple-probe design, required: (1) the selection of two nonspeech modes that the young autistic subjects could

possibly learn; (2) training language responses with one mode and assessing the children's learning of that mode; and (3) training different language responses with the other mode, and then assessing learning of that mode. In addition to obtaining data on the children's performance in the nonvocal modes, data were also collected on correct verbal responses that accompanied responses in the nonvocal mode.

Selection of nonvocal training modes. Selection of the training systems was determined by weighing available information on the subjects' sensory input and response output modes with information about the characteristics of individual nonspeech systems. With regard to possible sensory impairments, medical reports showed no auditory, visual, or motoric impairments for any of the subjects. Based on this information, no restrictions were placed on the use of signs, pictures, abstract plastic symbols, or written words. Next, the characteristics of the potential nonspeech training modes were examined. As mentioned above, some systems are letter-based, some are word-based, and some are concept-based in nature. In order to promote generalization from the nonspeech modes to speech, the decision to train word-based nonvocal systems was made. Potential training modes were thus narrowed down to printed words, Signing Exact English, and Non-SLIP abstract plastic symbols. Since these three systems utilize input and output modes that were available to the children, potential advantages and disadvantages of the three word-unit systems were specified. This comparison is shown in Table 1.

Insert Table 1 about here

Based primarily on the possibility that the children would have difficulty making the fine visual discriminations required in reading printed words,

Signing Exact English and Non-SLIP abstract plastic symbols were chosen as the nonspeech modes for training.

The pre-training condition. The conditions of the study are outlined in Table 2. Identical probes were administered at four critical points

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Insert Table 2 about here

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to assess the effects of training each mode on learning. (For a description of the probes, see Probes, p. 10.) After Probe 1 was administered, the pre-training condition was begun. As indicated in Table 2, the purpose of the Pre-Training condition was "to identify and include as subjects in the remainder of the study, those children who, by the end of 15 sessions, could imitate signs, match symbols, and match objects" (which in this study were foods). The rationale for including this training/assessment phase on imitative matching was provided by Hollis, Carrier, and Spradlin (1976), who stated that it would be unlikely for a child to make cross-modal or non-imitative matches (say, for example, matching the written word "cat" with a picture of a cat) before the child could make intramodal or imitative matches (for example, matching the word "cat" with the word "cat").

Fifteen individualized sessions containing 15 trials each were allotted on each of the match-to-sample tasks. Correct responses were reinforced with praise and bites of food which corresponded to the food used in the matching task. When a child did not respond or responded incorrectly, the experimenter repeated the instruction to match items. If the child again failed to respond correctly, the experimenter put the child through the motion, modelled the correct response, or prompted the correct response. Verbal praise was given for appropriate behavior, sitting and eye contact.

Criterion for continuation in the study was set at 80% correct in two sessions for the tasks of matching signs, matching symbols, and matching objects.

Results of pre-training. At the beginning of the study, Tony, who was 5 years 7 months, was echolalic with a small spontaneous verbal repertoire that consisted mainly of "okay," "stay here," and "don't want it." Tony reached criterion on all of the match-to-sample tasks.

Shane was 8 years 8 months when the study began. His language consisted of one- and two-word utterances that were largely unintelligible. Shane also reached criterion on each task.

Marlon was 5 years 5 months. At the beginning of the study, when told to repeat a word, Marlon usually repeated only the first syllable. He did not repeat two-word phrases and had a limited spontaneous vocabulary. Marlon also reached criterion on each of the pre-training tasks.

Dawn, who was 7 years of age, had no speech and poor eye contact and attending skills. In the 225 trials in each of the match-to-sample tasks, Dawn attained mean scores of 0% correct in sign, 4% correct in symbol, and 9% correct in object. Based on these results and the unlikelihood that she would benefit from nonspeech training at that point in time, Dawn was dropped from the study.

The fifth child, Jeff, was 5 years 9 months old. Jeff did not initiate speech or give unprompted verbal responses. When told to say a word, he repeated the first syllable only. Jeff spent much time repeating nonsensical sounds. He reached criterion on each of the pre-training tasks except sign, on which he scored 73% with three signs in the last two pre-training sessions.

And finally, Stephanie, who was 7 years old and nonverbal, reached criterion on the symbol match-to-sample task only. Mean scores in both the sign and object tasks were under 50% correct.

Thus, based on the criterion set for continuation in the study - that is, an 80% correct performance level on each of the match-to-sample tasks, Jeff and Stephanie, in addition to Dawn, should have been dropped from the study. However, in order to test the hypothesis that children who could not match imitatively would be unable to make the nonimitiative matches required in using language, and also in hopes that Jeff and/or Stephanie might begin to learn at some point during the course of the study, they continued to participate in the study along with Tony, Shane, and Marlon.

Procedure for training responses in sign and abstract plastic symbol nonspeech modes. After pre-training, probes identical to those in Probe 1 were administered to assess the effects of pre-training on learning. The subjects were then randomly assigned to either a sign or a symbol training condition. Jeff and Tony received training in sign. Marlon, Shane, and Stephanie received training in abstract plastic symbols (Non-SLIP). Step-by-step criterion-based programs were designed for training in the sign and symbol systems. The goal sentence for both training modalities was, "I see (noun)." Figures 1 and 2 show the basic steps involved in the sign and symbol training programs. In most cases, these basic steps were modified according to the performances of individual children.

Insert Figures 1 and 2 about here

Individualized training sessions consisted of 15 trials. During each trial a food was presented and the stimulus question, "What do you see?"

was asked. During sign training the experimenter signed and simultaneously verbalized the question. The children were never required to verbalize their responses. As in the Pre-Training Phase, correct nonvocal responses were reinforced with verbal praise and bites of food which corresponded to the food used in training. Verbal praise was also given for general compliance, eye contact, and appropriate behavior. When an incorrect response was given, the instruction was repeated. If the child responded incorrectly again, the experimenter put him or her through the correct response, prompted the correct response, or modelled the correct response for the child to imitate.

A criterion of 80% correct in two sessions was required in order to move from one step of training to the next. In addition to counting the number of correct and incorrect responses made in the nonvocal modes, data were also collected on the number of correct verbalizations. Correct verbalizations were defined as spontaneous productions that corresponded to the sign or symbol response which was required of the child. For example, if a child was to sign "see candy," the correct verbalization would also be "see candy".

Following Training Phase I, which lasted three weeks, the same probe items that were administered in Probes 1 and 2 were readministered in order to assess the effects of training on learning.

After Probe 3, Training Phase II was conducted for three weeks. The children were trained in the mode which was not trained in Training Phase I. The training procedures were identical to those used in Training Phase I. Training Phase II was followed by readministration of the probe items.

Probes. Ten structured probes were administered before and after the Pre-Training condition, and after Training Phases I and II (see Table 2).

The probes were designed to assess knowledge of stimulus equivalences which were both directly and indirectly taught during the training conditions. They included assessment of receptive and productive skills in sign, associative abilities using abstract plastic symbols, receptive and productive skills in speech, and cross-modal transfer between speech and the non-speech modes. Criterion level performance on each probe was set at 75% correct. The stimulus input and response output involved in each of the 10 probe items are listed in Table 3 and are presented diagrammatically in Figure 3.

Insert Table 3 and Figure 3 about here

Results. The general results of the study will be briefly discussed for each subject. Results for Jeff and Stephanie, the two children who did not reach criterion on all of the match-to-sample tasks in the Pre-Training condition, will be presented first.

Jeff: During Training Phase I, Jeff learned to make the signs representing three foods. However, he never produced the signs over a 60% correct level when the stimuli were random presentations of two or three foods. Correct verbalizations per session ranged from 0 to 6 (out of a possible 15) with a mean of 1. Jeff verbalized correctly on 9% of the training trials involving sign.

The results of the probes are indicated in Table 4.

Insert Table 4 about here

The results of Probe 1, which was administered prior to the Pre-Training condition, indicated that at the onset of the study, Jeff was unable to make the nonimitative associations involving sign, symbol, objects, and speech. Following the match-to-sample training during the Pre-Training condition, Jeff met criterion (75% correct) on the Speech-Object stimulus equivalence. That is, when the experimenter verbally named a food, Jeff could point to the corresponding food out of four choice food items. Jeff did not meet criterion on any of the probes involving sign or symbol.

The probes were administered for a third time (Probe 3) following the three-week sign training condition. Results of these probes showed that Jeff no longer made the Speech-Object association, which he had reached criterion on in Probe 2. Furthermore, he did not reach criterion on any of the stimulus-equivalence relationships involving sign: Object-Sign; Sign-Object; Sign-Speech; Speech-Sign.

Training Phase II was conducted following Probe 3. During this three-week period, Jeff learned to associate two symbols with their corresponding foods. Correct verbalizations ranged from 4 to 15 with a mean of 13 per session. Correct verbalizations occurred on 89% of the training trials. This is a considerable increase over the number of verbalizations produced during sign training.

The results of Probe 4, administered after Training Phase II, can be seen in Table 4. The data indicate that Jeff did not meet criterion on any of the probe items, including those assessing relationships involving symbol (the nonvocal mode just trained).

Stephanie: Training Phase I consisted of symbol training for Stephanie. During this time Stephanie learned to associate one symbol with its

corresponding food. She produced no correct verbalizations during the symbol training phase.

Results of probes, shown in Table 4, indicated that Stephanie did not make the stimulus-equivalence relationships involving sign, symbol, objects, and speech prior to Pre-Training (Probe 1). Criterion was again not met on any of the equivalences tested during Probe 2, following the match-to-sample training occurring during the Pre-Training condition. Results of Probe 3, administered after the three-week symbol training condition, showed that Stephanie again did not meet criterion on any of the probe items. These results indicated that training in Training Phase I was ineffective.

During Training Phase II, Stephanie learned to make the signs for two foods, but she averaged at 37% correct when the two corresponding foods were randomly presented. As in the symbol training condition, Stephanie produced no correct verbalizations during sign training.

Criterion was not met on any of the probe items administered following Training Phase II (see Table 4, Probe 4), indicating that sign training was ineffective.

The probe data show that neither Jeff nor Stephanie learned either nonvocal training mode. Since Jeff and Stephanie were the only two subjects who did not meet criterion on all of the Pre-Training match-to-sample tasks, the results support the notion that imitative matching skills are necessary before nonimitative matches, such as those required in communication, can be expected to occur.

The remaining three subjects did learn at least one of the nonspeech modes trained.

Marlon: Data presented in Table 4 indicate that Marlon did not meet criterion on any of the tasks prior to Pre-Training. In Probe 2, however,

following Pre-Training, Marlon reached criterion on the Object-Speech probe. During this probe, the experimenter presented a single food item, and the child named it.

During Training Phase I, Marlon learned to associate two symbols with two corresponding foods. Correct verbalizations ranged from 2 to 15 with a mean of 8 per session. Correct verbalizations occurred on 51% of the training trials.

Marlon reached criterion on two probe items during Probe 3, which was administered following the three-week symbol training period. When a symbol was presented, Marlon was able to point to the corresponding food item (from four choice food items). This was the Symbol-Object probe. He also met criterion on the Speech-Object probe - when the experimenter named a food, Marlon could point to the corresponding item (four choice stimuli were presented).

During Training Phase II, Marlon learned to make the signs representing three foods. He also learned to sign the phrase "see cookie". Correct verbalizations ranged from 5 to 15 with a mean of 10. Correct verbalizations were made on 70% of the training trials.

Data from Probe 4, administered following the sign training condition, are shown in Table 4. Marlon met criterion on all four of the probes involving sign. The four probes were: Object-Sign—when the experimenter presented a single food item, the child produced the corresponding sign; Sign-Object—when the experimenter made the sign representing one of the foods, the child pointed to the corresponding food (from four choice stimuli); Sign-Speech—when the experimenter made the sign representing a food item, the child verbally named the corresponding food; and Speech-Sign—when th

experimenter verbally named one of the foods, the child produced the corresponding sign. In addition to reaching criterion on the four probes involving sign, Marlon also reached criterion on the Speech-Object probe (when the experimenter verbally named a food, the child pointed to the corresponding food from four choice stimuli).

Three factors were used as indicators for prescribing a nonvocal mode for training. The three factors were: (1) learning of nonspeech responses taught in each training condition; (2) percentage of correct verbalizations produced in each training condition; and (3) performance on the probes.

Since Marlon learned more during sign training, spoke more during that condition, and scored better on the sign probes, sign was prescribed for continued training.

Shane: Prior to the Pre-Training condition, Shane was able to point to the object named by the experimenter (Speech-Object probe) during Probe 1 (see Table 4). Following the match-to-sample training in the Pre-Training condition, Shane again met criterion on the Speech-Object probe (see Table 4, Probe 2), but he did not reach criterion on any of the other stimulus-equivalence tasks.

During Training Phase I, Shane learned to associate three symbols with three corresponding foods. Correct verbalizations ranged from 7 to 15 with a mean of 13. Correct verbalizations were stated on 84% of the training trials.

Data from Probe 3, administered after Training Phase I in symbol (see Table 4), indicated that Shane again met criterion on the receptive skill of pointing to the object named by the experimenter (Speech-Object), but he

did not meet criterion on any of the four tasks involving symbols (i.e., Object-Symbol; Symbol-Object; Symbol-Speech; Speech-Symbol).

During sign training in Training Phase II, Shane learned to make the signs representing three foods. He also learned to sign the phrase "see (noun)," using each of the three food signs. The range of correct verbalizations was 0 to 15, with a mean of 8. Correct verbalizations in sign training occurred on 65% of the training trials.

Results of Probe 4 after sign training (see Table 4) indicated that criterion was met on the probes assessing expressive (Object-Sign) and receptive (Sign-Object) skills in sign, as well as on probes assessing cross-modal transfer (Sign-Speech and Speech-Sign).

The indicators for prescribing a nonvocal training mode thus showed that although Shane learned more signing responses than symbol responses and performed better on the sign probes, he produced more correct verbalizations during symbol training. However, since learning of symbols was so poor, it was not viewed as a potential functional communication system for Shane, and sign was prescribed for continued training.

Tony: As indicated in Table 4, Tony met criterion on the probes assessing expressive (Object-Speech) and receptive (Speech-Object) skills in speech during Probe 1. Following the match-to-sample training during the Pre-Training condition, Tony reached criterion on all but one of the non-imitative equivalences during Probe 2. As indicated in Table 4, Tony did not meet criterion on the Sign-Object task. During this probe, rather than pointing to the object that the experimenter had signed, Tony tended to imitate the sign stimuli.

During the first training condition, Tony learned to make the signs representing three foods. He also learned to sign the phrase "see (noun)," using each of the three food signs. By the end of three weeks, Tony was able to sign "I see (noun)," using two food signs. Correct verbalizations ranged from 0 to 15, with a mean of 9. Correct verbalizations occurred on 59% of the training trials.

Results of Probe 3 (see Table 4) showed that Tony reached criterion on all of the probes involving sign, including Sign-Object, which he did not have on Probe 2. Tony also retained from Pre-Training, the relationships involving symbols.

During Training Phase II, Tony learned to respond with symbols so rapidly that additional steps were added to the training program. By the end of Training Phase II, Tony could discriminate nine symbols, and could arrange them to construct the sentence "I see the (noun)." The noun class included symbols representing four foods, boy, and girl. Correct verbalizations ranged from 4 to 15, with a mean of 11. Correct verbalizations occurred on 74% of the training trials.

Data from Probe 4 are presented in Table 4. These data indicate that following training in symbol, criterion was met on all of the probe items involving symbol (i.e., Object-Symbol; Symbol-Object; Symbol-Speech; Speech-Symbol). Criterion was also met on three of the four tasks involving sign (i.e., Sign-Object; Sign-Speech; Speech-Sign), as well as the two tasks assessing expressive (Object-Speech) and receptive (Speech-Object) skills in speech.

The three indicators for prescribing a training mode were: (1) better performance in the symbol training condition; (2) more correct verbalizations

during symbol training; and (3) equivalent performance on the sign and symbol probes. The prescription made for Tony was symbol with an emphasis on developing reading. Reading was prescribed because printed words, like abstract plastic symbols, involve stimuli that are both visual-spatial and permanent. Reading, however, is a more functional mode of communication because it can be shared with more people. Based on the accuracy of Tony's responses with symbols, and the rate at which learning occurred, it seemed reasonable to expect Tony to be able to learn the more complex discriminations involved in reading.

Recommendations for Implementation of Procedure for Identifying the Optimal Nonspeech Mode

To sum up this discussion on selecting a nonspeech mode, several factors will be emphasized which may be useful to those who are considering adopting a similar strategy for determining which nonspeech mode to train.

First, keep in mind that any two nonspeech modes can be trained. In an article which was recently published in the Journal of Autism and Developmental Disorders, for example, Kiernan (1981) compared learning of sign with learning of pictorial symbols by three autistic children. Selection of modes for training should be based on the probability that the child will learn those modes, and also, and very importantly, on the probability that others in the nontraining environment will use the nonvocal mode to communicate with the child.

Second, it should be emphasized that foods do not have to be used as the training items. Foods were used in the study described above because they functioned as reinforcers for the children, but also because using the same stimuli for all five children simplified the task of preparing several

daily training sessions for each of five children. Nonedible stimuli/ reinforcers should also be carefully considered. Also, a combination of reinforcing foods and objects can be used.

Third, before planning the sequence of steps for training responses in each mode, it is recommended that effective procedures for teaching discrimination skills be examined. In the present study it was found that when first one correspondence between a reference and its sign or symbol was trained to criterion, and then a second correspondence between another referent and its sign or symbol was trained to criterion, learning of the second correspondence was often very difficult. Furthermore, when it was finally learned, the first correspondence trained was often forgotten. Also, it appeared that some children learned that there was a relationship between making a response and receiving a reinforcer, but they did not seem to learn that there was a one-to-one relationship between a particular response and a particular reinforcer. In order to strengthen the children's discrimination skills it might be better to start off training the discrimination between two referents and their corresponding symbolic responses, as opposed to first training one correspondence, then training a second correspondence, and then checking for discrimination.

Finally, rather than training the two modes successively, consideration should be given to concurrent training, using an Alternating Treatment Design (Barlow & Hayes, 1979), of separate responses in each nonspeech mode. Concurrent training might expedite training, and it would also eliminate the possibility of a kind of "learning-to-learn" phenomenon from occurring. What is meant by "learning-to-learn" is, for example, learning after repeated trials, that making any response does not result in obtaining

the reinforcer, but rather, that there is a one-to-one relationship between response and reinforcer. Training two nonspeech modes concurrently would eliminate the risk of better performance being obtained on the mode trained last simply because it was trained last.

Long-Term Training Through Incidental Language Training Procedures

The remainder of this paper will focus on several issues related to long-term training of the prescribed nonspeech mode. The purpose of training nonspeech modes is to provide children who do not use vocal language with an alternative functional means of communication. To be truly functional for the child, he or she should be able to use the system not only in the language training setting with the language clinician, but also with other relevant people in his or her environment. This means that in addition to the one-to-one language training sessions with the clinician, which may be at least initially necessary for establishing a basic vocabulary and use of syntax, the child must also have opportunities to use the communication system to interact socially with different people in a variety of settings. Not only may such practice increase the child's rate of learning, but it will also promote generalization across people, situations, and settings.

The language clinician's job then, becomes one of not only working individually with the child, but also training relevant others, such as parents and teachers, to use the nonvocal system to communicate with the child. Specifically, because parents and teachers interact with the child in the natural environment, they should be trained to apply procedures for eliciting appropriate nonvocal language responses in naturally occurring situations.

I am currently engaged in a research project that involves training mothers of language-delayed preschoolers to use four techniques for purposes of improving their children's language skills. The techniques are designed to be used in the natural environment at any time and in any situation that can be used as an occasion to work on the child's language. Although the techniques are currently being used to build functional vocal communication skills, they are being discussed here because of their potential value for training functional nonspeech language.

The first technique trained is called the Model Procedure. The primary child-goals of the Model Procedure are: (1) to train generalized imitation, (2) to establish a basic vocabulary; and (3) to train a strategy for incidental learning of vocabulary. The steps included in the Model Procedure are illustrated in the flowchart in Figure 4.

Insert Figure 4 about here

To illustrate how the Model Procedure may be incidentally used to train speech, the following example is offered:

Setting and situation: Child's bedroom where mother is helping child get dressed.

Mother: (holds up child's shirt) This is the shirt you can wear today. Say "shirt".

Child: Shirt.

Mother: Yes, here is your shirt. Let's see you put your shirt on.

(If the child had not responded correctly to the first model, the mother would present the model a second time before presenting praise or corrective feedback. See Figure 4)

With modification, the basic steps of the Model Procedure could also be used when a nonvocal mode is being trained. If, for example, the training mode is sign, the mother in the example above could hold up the child's shirt and sign and simultaneously say "shirt". She could then instruct the child to sign "shirt". If the child responded correctly the mother would immediately praise the child and give him or her the shirt to put on. If the child made no response or an incorrect response following the mother's instruction, the mother would repeat the instruction and present a second model of the sign for shirt. If the child responded correctly to the second (corrective) model, the mother would present immediate praise and give the child the shirt. If an incorrect response followed the second model, the mother would present the least prompt necessary to get the child to make the sign for shirt. Praise plus the shirt are given to the child following an attempt to sign "shirt," or, if no attempt to sign "shirt" is made, the mother would give corrective feedback—i.e., she would sign and simultaneously say "shirt" and give the shirt to the child.

The second technique trained is called the Mand-Model Procedure (cf. Rogers-Warren & Warren, 1980 for background information on this procedure). The primary child-goal of the Mand-Model Procedure is to teach the child to provide upon request, information he or she already knows, or is likely to know. (This information may have been previously trained using the Model Procedure.) The steps included in the Mand-Model Procedure are outlined in the flowchart in Figure 5. As can be seen in the flowchart, the Mand-Model Procedure incorporates the Model Procedure.

Insert Figure 5 about here

The following example illustrates how the Mand-Model Procedure can be used to train speech:

Setting and situation: Child has just entered the house after being outside on a hot day.

Mother: If you're thirsty you can have something to drink. Tell me what you would like to drink.

Child: Juice.

Mother: Okay, I'll get you some orange juice.

(If the child had not responded correctly to the first mand, "Tell me what you would like to drink," the mother would then have the option of providing a second mand, and thus a second opportunity for the child to provide an answer, or the mother could go directly into the Model Procedure and present a model for the child to imitate. See Figure 5.)

Like the Model Procedure, the Mand-Model Procedure can also be modified to be used with a nonvocal mode. The situation described above, for example, could take place if a nonvocal mode was the functional communication mode being trained. Imagine that a nonvocal child is learning to communicate using pictures. The mother could offer the child something to drink and then say, "Show me what you want to drink." The target child response would involve pointing to one of several pictures of beverages. If the child did not point to one of the pictures, the mother could present a second mand, or she could elicit a yes/no response concerning the choice beverage and then go directly into the Model Procedure. Since the Model Procedure requires only an imitative response, once the desired beverage was determined, the mother would model pointing to the appropriate picture. If the child did not imitate pointing, the mother would model pointing again, and if necessary, prompt the child to point to the appropriate picture.

The third technique trained is called the Delay Procedure (cf. Halle, Baer, & Spradlin, 1981; Halle, Marshall, & Spradlin, 1979). The Delay Procedure is used to train the parent to allow the child time to initiate communication about needs, wants, or environmental stimuli. Thus, unlike the Model and Mand-Model Procedures, in which the adult verbally elicits language from the child, the Delay Procedure teaches the adult to refrain from talking in order to afford the child an opportunity to initiate an interaction. The previously trained Model and Mand-Model Procedures are embedded in the Delay Procedure. The steps included in the Delay Procedure can be found in the flowchart in Figure 6.

Insert Figure 6 about here

In the following example, the Delay Procedure is being used to teach the child to initiate a vocal request for help:

Setting and situation: The mother and child are about to play with tinker toys, and the child is struggling to get the lid off the container.

Mother: (observes the child, but does not pre-empt a child request for help by opening the container)

Child: Help, please.

Mother: Sure, I'll help you open the box.

(If the child had not responded appropriately to the mother's delay, several options were available to the mother. The mother could: (1) use the Model Procedure: (2) use the Mand-Model Procedure; or (3) present another delay, followed if necessary, by the Model or Mand-Model Procedure. See Figure 6.)

The Delay Procedure could also be adapted for use with any one of several possible nonvocal modes. For example, rather than pre-empting a child in situations where the child is likely to need to communicate, the parent could delay (but attend to the child and convey the presence of an interested "listener"), and in so doing, provide the child an opportunity to initiate language in his or her nonvocal training mode.

Referring again to the example above, a child who is learning signs could be expected to initiate the sign for "help" following the adult's delay. If the child did not sign "help," the adult could model the response, ask the child "What do you need?", or present a second delay as a cue for the child to sign for assistance.

The Incidental Teaching Procedure is trained last (cf. Hart & Risley, 1968; 1974; 1975; 1980). This procedure simply requires using the three previously trained procedures in a new situation. Whenever the child initiates a request or a command (and in so doing, specifies a reinforcer), the adult elicits more complex or elaborated language from the child by following up the request/command with either the Model, Mand-Model, or Delay Procedure. The steps in the Incidental Teaching Procedure are presented in the flowchart in Figure 7.

Insert Figure 7 about here

To illustrate how the Incidental Teaching Procedure can be used to elicit elaborated verbal responses, the following example is presented:

Setting and situation: The mother and child are engaged in separate activities in the kitchen.

Child: (points to cookie jar) Cookie.

The mother then has the option of using either the Model, Mand-Model, or Delay Procedure to elicit additional information from the child. (See Figure 7.) She could, for example, present the model, "Say I want cookie"; or she could present the mand, "What kind of cookie do you want?"; or she could delay as a cue that an additional response (e.g., "Cookie, please") is desired.

The Incidental Teaching Procedure, like the Model, Mand-Model, and Delay Procedures, could be modified for use with nonvocal modes. If, for instance, either sign, pictures, written words, or plastic symbols was the communication mode being trained, the Incidental Teaching Procedure could be utilized by having the adult withhold the requested object or action until the child gave additional information or an elaborated response using the nonvocal communication system.

While the description of the four language-training techniques has been somewhat brief, their inclusion here is deemed appropriate because of their potential value as a framework for training parents to incidentally teach nonvocal language responses. Although the benefits of training parents to use the techniques to train speech has been experimentally demonstrated, research demonstrating the effectiveness of training parents to apply the techniques to train nonvocal language remains to be done.

In summary, this paper has focused on two important issues surrounding nonspeech language intervention. The first issue addressed the problem of selecting a nonspeech mode for training with individual children. A procedure was described in which two nonspeech modes were systematically trained, and then based on the results of training and probes, one of the trained non-

speech modes was prescribed for long-term training. The second issue focused on four specific procedures that parents and others could be trained to use to assist the child in learning communicative responses with the prescribed nonspeech mode. Because the techniques are designed to be used incidentally in naturally occurring situations, and because they focus on the function rather than on the form of language, the techniques are well-suited for programming generalization across situations and settings.

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Table 1

Potential advantages and disadvantages of nonspeech word-unit systems

Printed word		Signing Exact English		Abstract plastic symbols	
+	−	+	−	+	−
1. May be shared with majority of the population	1. Complexity of stimulus input (which may be difficult for very young and/or severely retarded children to learn)	1. Attempts to maintain English morphology, semantics, and syntax, which may facilitate learning of speech	1. Response output requires motor movements (which may prove to be difficult for some children)	1. Can be designed to maintain English morphology, semantics, and syntax, which may facilitate learning of speech	1. Symbols must always be accessible to the child
2 Circumvents difficulty of learning phonetic rules	2. Response output requires: a) complex fine motor response (i.e., printing), or b) child to carry word cards with him	2. Circumvents difficulty of learning phonetic rules	2. Limited number of people will be able to communicate with the child	2. Circumvents difficulty of learning phonetic rules	2. Unless printed word is written on plastic symbol, majority of people will not be able to communicate with the child
3 Corresponds in a one-to-one relationship with English, improving the possibility of generalization to writing and speech		3. Does not require child to carry any extra materials	3. Stimulus permanency: Fleeting	3. Child may use symbols without producing them	
4 Stimulus permanency: Semi-permanent		4. Physical movement paired with verbal stimulus may stimulate speech production		4. Stimulus permanency: Semi-permanent	
5 The number of available choice symbols may be controlled by the trainer				5. The number of available choice symbols may be controlled by the trainer	

Table 2

Description of Experimental Conditions

PRE-TEST PROBE 1	PRE-TRAINING PHASE	PROBE 2	TRAINING-- PHASE 1	PROBE 3	TRAINING-- PHASE II	PROBE 4
Purpose: To assess: 1) receptive and expressive skills in sign, symbol, speech; 2) cross-modal transfer	Purpose: To identify and include as subjects in the remainder of the study, those children who, by the end of 15 sessions, could imitate signs, match symbols, and match foods. Tasks: 1) SIGN: imitate the signs for candy, chip, pretzel, and cookie 2) SYMBOL: match symbols representing donut, peanut, popcorn, and cracker (4 choice symbols) 3) OBJECT: match foods listed under SIGN and SYMBOL (4 choice stimuli presented on any given trial) 4) SPEECH: imitate one-word stimuli (stimuli were names of the foods listed under SIGN and SYMBOL)	Purpose: To assess the effects of Pre-Training on learning Tasks: Same as Probe 1	Mode: Sign Goal: I see (noun) candy chip pretzel cookie Subjects: Jeff Tony --- Mode: Symbol Goal: I see (noun) donut peanut popcorn cracker Subjects: Marlon Shane Stephanie	Purpose: To assess the effects of training conducted in Training Phase I on learning. Tasks: Same as Probe 1	Mode: Sign Goal: I see (noun) candy chip pretzel cookie Subjects: Marlon Shane Stephanie --- Mode: Symbol Goal: I see (noun) donut peanut popcorn cracker Subjects: Jeff Tony	Purpose: To assess the effects of training conducted in Training Phase II on learning. Tasks: Same as Probe 1

Table 3

Probes: Stimulus input and response output

Probe	Stimulus input	Response output
1. Production	Object	Sign
2. Comprehension	Sign	Object
3. Association	Object	Symbol
4. Association	Symbol	Object
5. Production	Object	Speech
6. Comprehension	Speech	Object
7. Cross-modal transfer	Sign	Speech
8. Cross-modal transfer	Speech	Sign
9. Cross-modal transfer	Symbol	Speech
10. Cross-modal transfer	Speech	Symbol

Table 4

Results of Probes

JEFF

	Probe Item	1	Pre-Training	2	Sign Training	3	Symbol Training	4
1.	Object-Sign	0%		25%		33% 44% *		25% 33% *
2.	Sign-Object	0%		38%		25% 33%		25% 33%
3.	Object-Symbol	25%		13%		42%		38% 50%
4.	Symbol-Object	0%		25%		25%		25% 33%
5.	Object-Speech	6%		38%		13%		50%
6.	Speech-Object	19%		81%		54%		63%
7.	Sign-Speech	0%		13%		25% 33%		13% 17%
8.	Speech-Sign	0%		25%		25% 33%		25% 33%
9.	Symbol-Speech	0%		13%		0%		25% 33%
10.	Speech-Symbol	13%		38%		13%		38% 50%

*Corrected for foods not trained.

STEPHANIE

	Probe Item	1	Pre-Training	2	Symbol Training	3	Sign Training	4
1.	Object-Sign	0%		13%		0%		25% 50%
2.	Sign-Object	13%		13%		17%		13% 25%
3.	Object-Symbol	0%		0%		0% 0%		0% 0%
4.	Symbol-Object	0%		13%		13% 25%		25% 50%
5.	Object-Speech	0%		0%		0%		0%
6.	Speech-Object	31%		6%		19%		25%
7.	Sign-Speech	0%		0%		0%		0% 0%
8.	Speech-Sign	0%		0%		0%		0% 0%
9.	Symbol-Speech	0%		0%		0% 0%		0% 0%
10.	Speech-Symbol	13%		0%		25% 33%		13% 0%

Table 4 (cont'd)

MARLON

	Probe Item	1	Pre-Training	2	Symbol Training	3	Sign Training	4
1.	Object-Sign	0%		50%		17%		(75%) (100%)
2.	Sign-Object	0%		25%		25%		(75%) (100%)
3.	Object-Symbol	25%		38%		33% 44%		38% 33%
4.	Symbol-Object	25%		0%		67% (89%)		50% 67%
5.	Object-Speech	25%		(75%)		69%		69%
6.	Speech-Object	50%		69%		(88%)		(88%)
7.	Sign-Speech	0%		0%		20%		(75%) (100%)
8.	Speech-Sign	0%		13%		0%		(75%) (100%)
9.	Symbol-Speech	0%		0%		0% 0%		25% 33%
10.	Speech-Symbol	25%		0%		42% 56%		50% 56%

SHANE

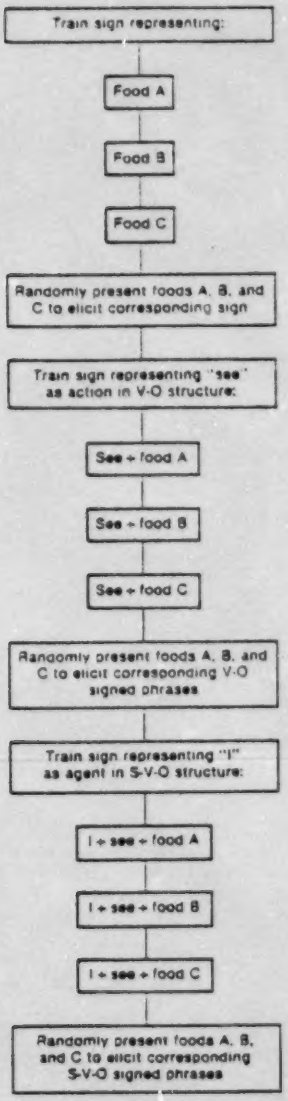
	Probe Item	1	Pre-Training	2	Symbol Training	3	Sign Training	4
1.	Object-Sign	0%		25%		17%		(75%) (100%)
2.	Sign-Object	25%		50%		25%		(75%) (100%)
3.	Object-Symbol	13%		40%		33% 33%		30% 50%
4.	Symbol-Object	25%		0%		33% 44%		30% 50%
5.	Object-Speech	38%		50%		72%		(94%)
6.	Speech-Object	(81%)		(75%)		(89%)		(89%)
7.	Sign-Speech	0%		25%		25%		(75%) (100%)
8.	Speech-Sign	0%		13%		8%		(75%) (100%)
9.	Symbol-Speech	0%		13%		0% 0%		0% 0%
10.	Speech-Symbol	25%		50%		33% 22%		10% 17%

TONY

Table 4 (cont'd)

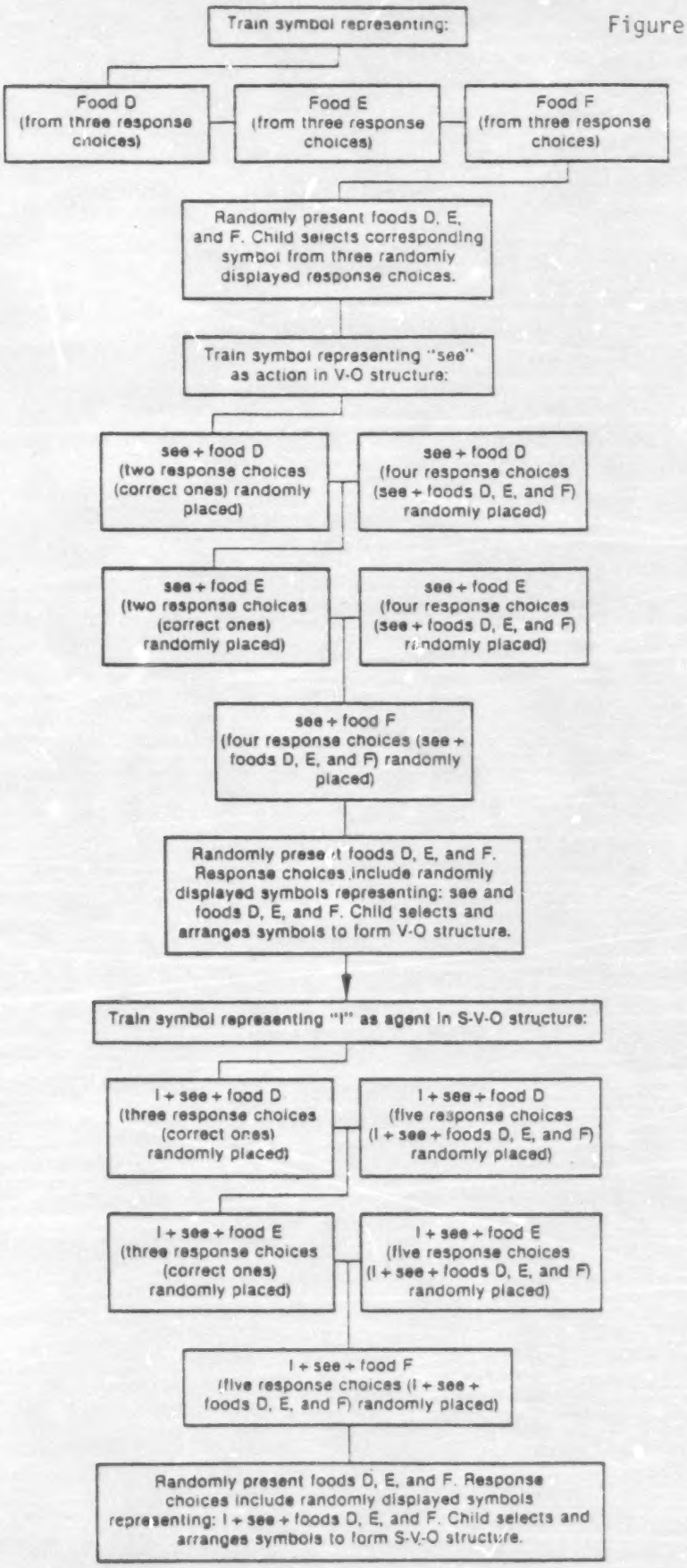
	Probe Item	1	Pre-Training	2	Sign Training	3	Symbol Training	4
1.	Object-Sign	13%		88%		100% 100%		50% 50%
2.	Sign-Object	0%		0%		100% 100%		100% 100%
3.	Object-Symbol	13%		100%		88%		100%
4.	Symbol-Object	25%		100%		83%		100%
5.	Object-Speech	94%		100%		100%		100%
6.	Speech-Object	100%		100%		100%		100%
7.	Sign-Speech	25%		75%		88% 83%		100% 100%
8.	Speech-Sign	13%		88%		88% 83%		88% 83%
9.	Symbol-Speech	25%		88%		100%		100%
10.	Speech-Symbol	25%		100%		100%		100%

Figure 1


Train sign representing:
Food A
Food B
Food C
Randomly present foods A, B, and C to elicit corresponding sign
Train sign representing "see" as action in V-O structure:
See + food A
See + food B
See + food C
Randomly present foods A, B, and C to elicit corresponding V-O signed phrases
Train sign representing "I" as agent in S-V-O structure:
I + see + food A
I + see + food B
I + see + food C
Randomly present foods A, B, and C to elicit corresponding S-V-O signed phrases

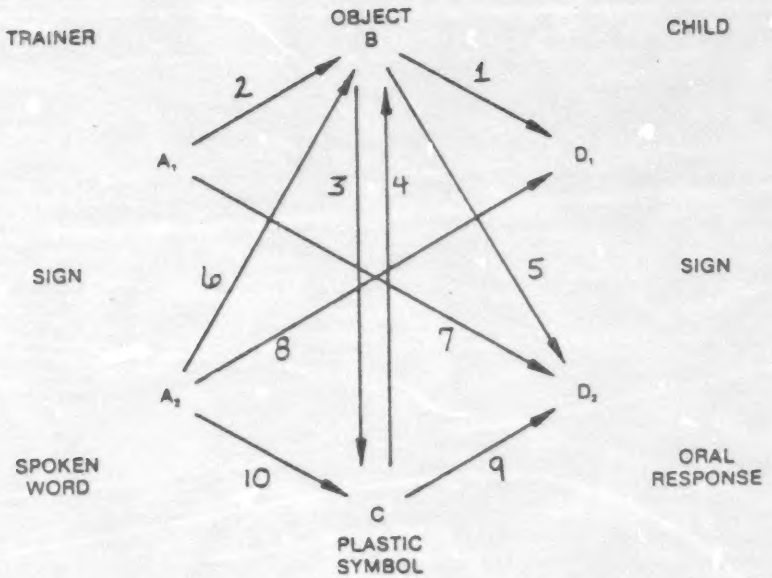
Flowchart of sample training program for teaching language responses in sign.

Figure 2


Train symbol representing:
Food D (from three response choices)
Food E (from three response choices)
Food F (from three response choices)
Randomly present foods D, E, and F. Child selects corresponding symbol from three randomly displayed response choices.
Train symbol representing "see" as action in V-O structure:
see + food D (two response choices (correct ones) randomly placed)
see + food D (four response choices (see + foods D, E, and F) randomly placed)
see + food E (two response choices (correct ones) randomly placed)
see + food E (four response choices (see + foods D, E, and F) randomly placed)
see + food F (four response choices (see + foods D, E, and F) randomly placed)
Randomly present foods D, E, and F. Response choices include randomly displayed symbols representing: see and foods D, E, and F. Child selects and arranges symbols to form V-O structure.
Train symbol representing "I" as agent in S-V-O structure:
I + see + food D (three response choices (correct ones) randomly placed)
I + see + food D (five response choices (I + see + foods D, E, and F) randomly placed)
I + see + food E (three response choices (correct ones) randomly placed)
I + see + food E (five response choices (I + see + foods D, E, and F) randomly placed)
I + see + food F (five response choices (I + see + foods D, E, and F) randomly placed)
Randomly present foods D, E, and F. Response choices include randomly displayed symbols representing: I + see + foods D, E, and F. Child selects and arranges symbols to form S-V-O structure.

Flowchart of sample training program for teaching language responses with

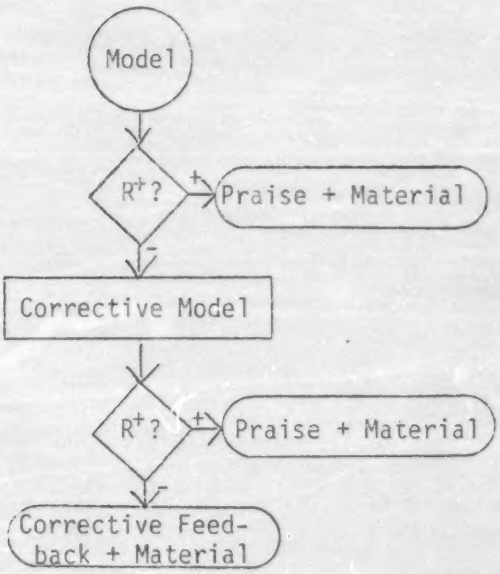
Figure 3



Schematic summary of 10 probe items. (Adapted from Sidman, 1971.)

Figure 4

Model Procedure

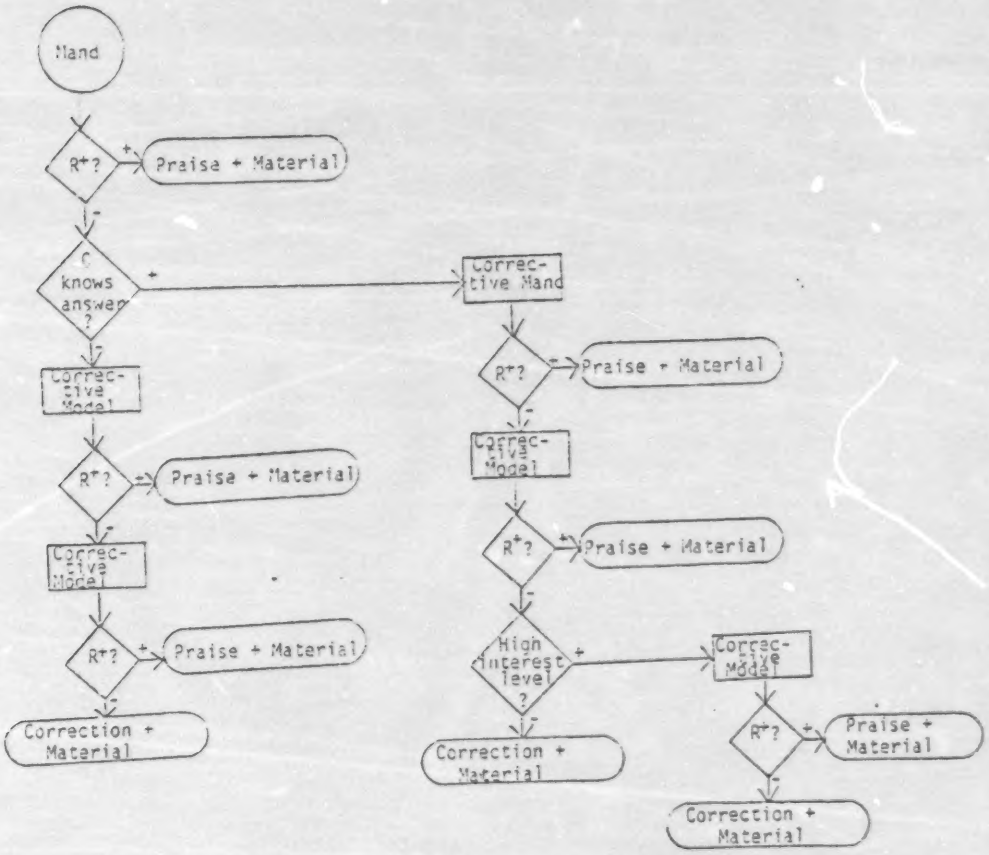


R^+ = Correct Response

-Adult presents model
-If child responds appropriately, adult offers praise (expansion) plus material
-If child responds inappropriately, adult presents model again (corrective model)
-If child responds appropriately to corrective model, adult offers praise (expansion) plus material
-If child responds inappropriately to corrective model, adult offers corrective feedback plus material

Figure 5

Mand-Model Procedure

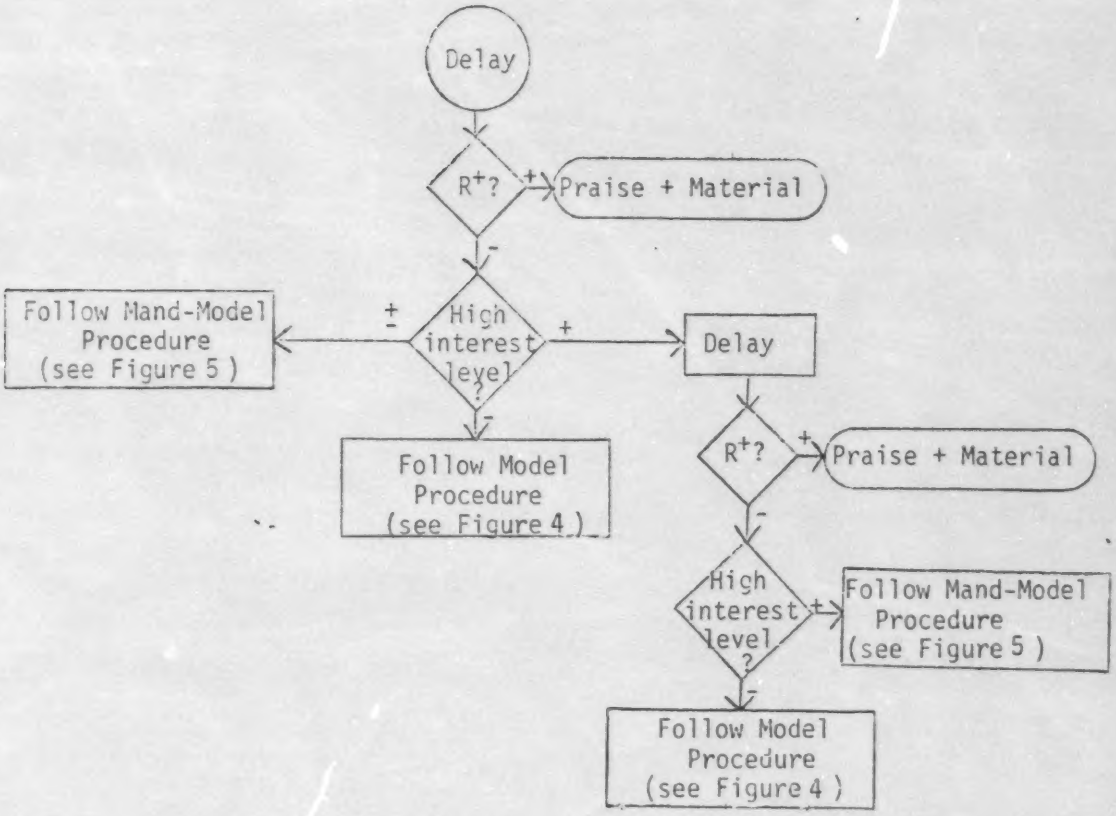


R^+ = Correct Response
C = Child

-Adult presents mand
-If child responds appropriately, adult offers praise (expansion) plus material
-If child responds inappropriately, adult has option of:
(A)-presenting corrective mand
-if child responds appropriately to corrective mand, adult offers praise (expansion) plus material
-if child responds inappropriately to corrective mand, adult presents corrective model
-if child responds appropriately to corrective model, adult offers praise (expansion) plus material
-if child responds inappropriately to corrective model, adult has option of:
(1) offering corrective feedback plus material
or (2) presenting another corrective model
-if child responds appropriately to corrective model, adult offers praise (expansion) plus material
-if child responds inappropriately to corrective model, adult offers corrective feedback plus material,
OR (B)-presenting corrective model.
-if child responds appropriately to corrective model, adult offers praise (expansion) plus material
-if child responds inappropriately to corrective model, adult presents another corrective model.
-if child responds appropriately to corrective model, adult offers praise (expansion) plus material.
-if child responds inappropriately to corrective model, adult offers corrective feedback plus material.

Figure 6

Time Delay Procedure

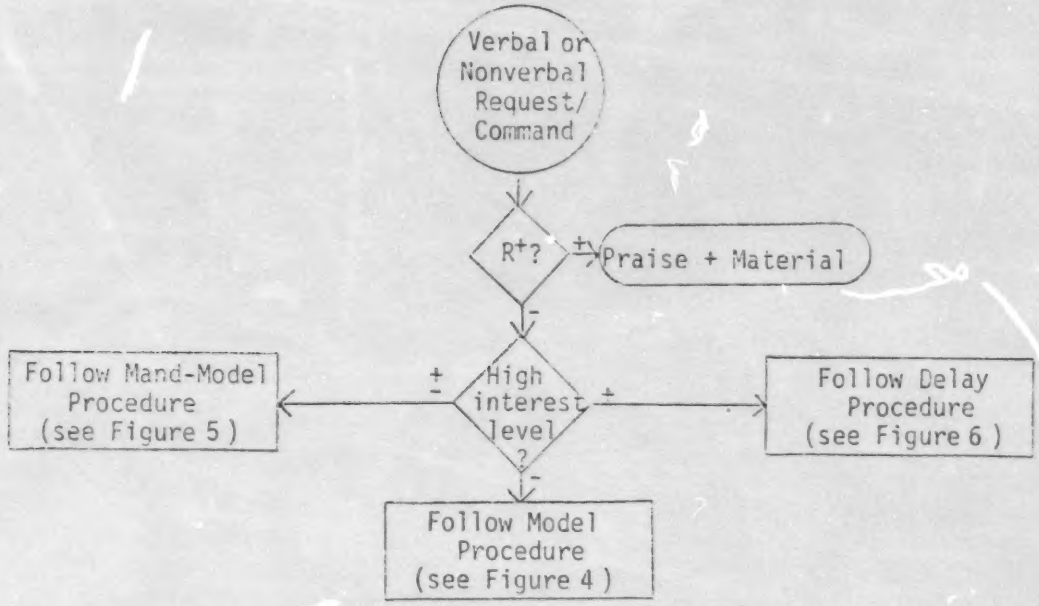


R^+ = Correct Response

-Adult presents time delay
-If child responds appropriately, adult offers praise (expansion) plus material.
-If child responds inappropriately, adult has option of:
(A) -presenting time delay again.
-if child responds appropriately, adult offers praise (expansion) plus material.
-if child responds inappropriately, adult has option of:
(1) -following steps of Mand-Model Procedure (see p. 22 for explanation of steps in Mand-Model Procedure),
or (2) -following steps of Model Procedure (see p. 21 for explanation of steps in Model Procedure),
(B) -following steps of Mand-Model Procedure (see p. 22),
or (C) -following steps of Model Procedure (see p. 21).

Figure 7

Incidental Teaching Procedure



R^+ = Correct Response

-Child makes verbal or nonverbal request/command.
-If request/command is appropriate, adult offers praise (expansion) plus material.
-If request/command is inappropriate, adult has option of:
(A) -following steps of Delay Procedure (see p. 24 for explanation of steps in Delay Procedure),
(B) -following steps of Mand-Model Procedure (see p. 22 for explanation of steps in Mand-Model Procedure),
Or (C) -following steps of Model Procedure (see p. 21 for explanation of steps in Model Procedure).